



Standard Specification for Standard Smooth Tire for Pavement Skid-Resistance Tests¹

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1. Scope

1.1 This specification covers the general requirements for the standard smooth tire for pavement testing. The tire covered by this specification is intended for evaluation of tire-pavement friction.

1.2 The terminology in this specification is consistent with Definitions E 867.

1.3 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

D 297 Test Methods for Rubber Products—Chemical Analysis²

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension²

D 1054 Test Method for Rubber Property Resilience Using a Rebound Pendulum²

D 1765 Classification System for Carbon Blacks Used in Rubber Products²

D 2240 Test Method for Rubber Property—Durometer Hardness²

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets²

E 867 Terminology Relating to Traveled Surface Characteristics³

3. Materials and Manufacture

3.1 The individual standard tires shall conform to the design standards of Section 5. Dimensions, weights, and permissible variations are given in Section 5 and in Fig. 1 and Fig. 2.

3.2 Tread compounding, fabric processing, and all steps in tire manufacturing shall be certified to ensure that the specifications are met.

3.3 A small raised guideline shall be molded on the tire

shoulder area to provide a rapid visual check as to whether the maximum wear level for testing has been reached. Tires should actually be removed from service as recommended in 11.5. The marking on the tire, as suggested in Fig. 1, and curb ribs shall be molded on both sides of the tire.

3.4 Fig. 1 is a photograph of the standard tire and Fig. 2 is a cross section of a typical tire.⁴

4. Material Requirements

4.1 The compounding formulation for the tread portion of the tire is given in Table 1.

4.2 *Fabric*—The fabric shall be polyester body or carcass plies and fiber glass belt plies.

NOTE 1—Certain proprietary products have been specified since exact duplication of properties of the finished tire may not be achieved with other similar products. This inclusion does not in any way comprise a recommendation for these proprietary products nor against similar products of other manufacturers, nor does it imply any superiority over any such similar products.

5. Dimensions, Weights, and Permissible Variations

5.1 *General*—Details of dimensions are listed as follows and are shown in Fig. 2. When tolerances are not specified, tire dimensions are subject to manufacturer's normal tolerances.

5.1.1 *Design and Construction*—The tire shall be a size G78-15 tubeless type, belted bias construction (two body plies plus two belt plies). The tread width shall be 5.85 in. (148.6 mm) and the cross-sectional tread radius shall be 15.50 ± 2.0 in. (393.7 ± 50.8 mm). The tread shall have a thickness of 0.385 in. (9.8 mm) and an under tread thickness of 0.10 in. (2.5 mm). The tire shall have a recommended cross-section width of 8.35 in. (212.1 mm) and a recommended section height of 6.34 in. (161.0 mm) when mounted on a Tire and Rim Association 15x6JJ rim. The cured crown angles shall be $33 \pm 2^\circ$ for the body plies, and $27 \pm 2^\circ$ for the belt plies.

5.1.2 *Wear Indicators*—A visual wear guideline shall be located on the shoulder of the tire 0.22 in. (5.6 mm) from the tread surface as shown in Fig. 2.

¹ The specification is under the jurisdiction of ASTM Committee E17 on Vehicle-Pavement Systems and is the direct responsibility of Subcommittee E17.24 on Tire and Slider Characteristics.

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² *Annual Book of ASTM Standards*, Vol 09.01.

³ *Annual Book of ASTM Standards*, Vol 04.03.

⁴ ASTM E524 tire is available from Specialty Tires of America, P.O. Box 749, 1600 Washington St., Indiana, PA 15701.



FIG. 1 Test Tire

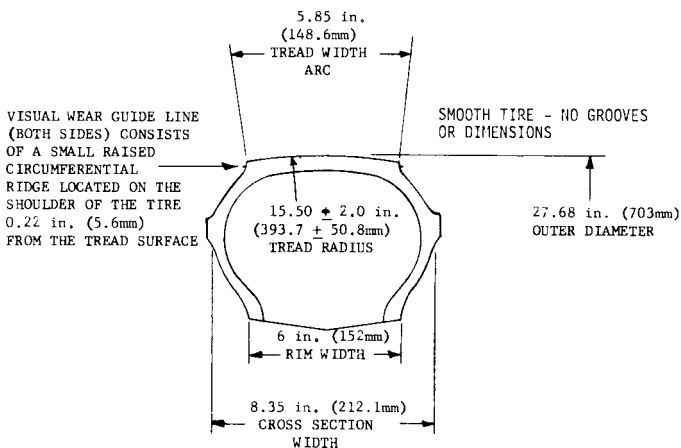


FIG. 2 Tire Section, Including Inflated Tire Dimensions

6. Workmanship

6.1 Tires shall be free of defects in workmanship and materials.

7. Physical Requirements

7.1 The physical and mechanical test requirements are given in Table 2.

8. Test Methods

- 8.1 *Tensile Sheet Cures*—Practice D 3182.
- 8.2 *Modulus (300 %)*—Test Methods D 412.
- 8.3 *Tensile Sheet Durometer*—Test Method D 2240, using a Type A Shore durometer.
- 8.4 *Restored Energy (Rebound or Resilience)*—Test Method D 1054.
- 8.5 *Specific Gravity*—Methods D 297.
- 8.6 *Tensile Strength*—Test Methods D 412.
- 8.7 *Elongation*—Test Methods D 412.

TABLE 1 Formulation of Oil Extended Styrene-Butadiene Blend Rubber (SBR) Tread

| Material | Parts by Mass (Weight) |
|--------------------------------|------------------------|
| SBR 1712 ^A | 89.38 |
| CB1252 ^B | 48.12 |
| N347 Carbon Black ^C | 75.00 |
| Highly aromatic oil | 9.00 |
| Zinc oxide | 3.00 |
| Stearic acid | 2.00 |
| Santoflex 13 ^D | 2.00 |
| Paraffinic wax | 2.00 |
| Santocure NS ^E | 1.10 |
| D P G ^F | 0.10 |
| Sulfur | 1.80 |

^A Styrene-butadiene rubber (23.5% styrene) 37.5 parts of high-aromatic oil.
^B Cis-poly butadiene with 37.5 parts of high-aromatic oil. (CB441 has been determined to be equivalent.)
^C N347 Carbon Black, see D1765.
^D Santoflex 13, dimethyl butylphenyl phenylenediamine.
^E Santocure NS, butyl benzothiozole sulfenamide.
^F DPG, diphenyl guanidine.

TABLE 2 Physical Requirements of Tread Compound

| | |
|--|-----------------------|
| Tensile sheet cure at 300°F (149°C), min | 30 |
| 300 % modulus, psi (MPa) | 800 ± 200 (5.5 ± 1.4) |
| Tensile sheet durometer | 58 ± 2 |
| Restored energy (rebound or resilience), % | 46 ± 2 |
| Specific gravity | 1.13 ± 0.02 |
| Tensile strength, min, psi (MPa) | 2000 (13.8) |
| Elongation, min, % | 500 |
| Tire tread durometer | 58 ± 2 |

8.8 *Tire Tread Durometer*—Test Method D 2240, in addition to the following procedures:

- 8.8.1 Use a Type A durometer. (A 0.5-in. (12.7-mm) diameter presser foot, Shore, Code XAHAF is recommended.)
- 8.8.2 The durometer shall be calibrated at a reading of 60 hardness.
- 8.8.3 Condition the tire and durometer to equilibrium at 73.4 ± 3.6°F (23 ± 2°C) before determining tread hardness.

8.8.4 The tire tread hardness is to be determined by averaging at least one set of 6 readings. A set should consist of readings taken at equally spaced intervals across the tread. It is recommended that additional sets of readings be taken around the tread circumference.

8.8.5 Apply presser foot to the tire tread as rapidly as possible without shock, keeping the foot parallel to the tread surface. Apply just sufficient pressure to obtain firm contact between presser foot and tire tread surface. Read the durometer scale within 1 s after presser foot is in contact with the tire tread, but after initial maximum transient which may occur immediately after contact is made.

9. Certification

9.1 Tires are to be inflated and measured prior to shipment. Upon request, the manufacturer shall furnish the purchaser certification that the test tire meets this specification.

9.2 All tires under certification shall be subject to manufacturer's normal variation.

10. Preservation

10.1 Tires shall be kept dry under ordinary atmospheric conditions in subdued light, $70 \pm 25^\circ\text{F}$ ($21 \pm 13.8^\circ\text{C}$). Tires should not be stored near electric motors, welders, or other ozone generating equipment.

11. Recommendations for Tire Use and Operational Requirements

11.1 The tire is for skid testing only and is not designed for general highway service. Necessary transporting of test equipment should be on commercial tires.

11.2 A new tire break in of 200 miles (320 km) min should be made on tires by the purchaser before using the tire for testing.

11.3 The tire shall be operated with not less than 24 psi (165 kPa) inflation.

11.4 The recommended static test load on the tire shall be 1085 lbf (4826 N), with loading to a maximum of 1380 lbf (6138 N) permissible, at 24 psi (165 kPa) inflation.

11.5 When irregular wear or damage results from tests or when the tire is worn to the wear line, the use of the tire as a standard test tire shall be discontinued.

11.6 **Caution**—Measured friction force and skid number (SN) may be influenced by tire tread hardness. The magnitude of this dependence is a function of the water depth, pavement characteristics, test speed, and tire aging effects.

12. Keywords

12.1 skid number; skid trailer; skid-resistance; smooth tire; tire-pavement friction; water depth

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